

ORIGINAL ARTICLE

AFRICAN JOURNAL OF CLINICAL AND EXPERIMENTAL MICROBIOLOGY JAN 2016 ISBN 1595-689X VOL 17 No.1
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 AFR. J. CLN. EXPER. MICROBIOL. 17 (1): 18-24 <http://dx.doi.org/10.4314/ajcem.v17i1.3>

PREVALENCE AND DISTRIBUTION OF INTESTINAL PARASITE INFECTIONS IN HIV SEROPOSITIVE INDIVIDUALS ON ANTIRETROVIRAL THERAPY IN VOM, PLATEAU STATE NIGERIA

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ABSTRACT

Background:The immunologic status of an individual can determine outcomes of treatment and their capacity to combat opportunistic infections. Co-infection with other parasites will confound the situation; however there is inadequate information on the interaction of HIV and helminth infections. We wanted to establish the relationship of the immunologic status and the prevalence of intestinal parasites in HIV/AIDS patients enrolled for antiretroviral therapy at the Vom Christian health centre. **Materials & Methods:** With their consent, stool samples of 205 subjects were collected and examined parasitologically by direct microscopy and concentration techniques. Their most recent CD4⁺ cell counts were obtained at the centre. The demographic characteristics of the subjects were determined from their response to a questionnaire. **Results:** Out of the 205 subjects examined 61.9% of them had various parasites with helminthes occurring in 51.9% of the cases. The age group of 31-40 years was the most significantly infected ($P < 0.05$). Hookworms and *Schistosoma mansoni* were most frequent with prevalence rates of 18.1% and 16.5% respectively. The highest prevalence of parasites occurred in HIV/AIDS people with CD4⁺ cells between 101-200 cells/ μ l and those with counts below 100 cells/ μ l. Occupation was highly associated with parasitic infections ($p < 0.05$). **Conclusion:** Parasitic infection remained highly prevalent among the subjects examined in spite of ART treatment and in the case of intense infection in the immunocompromised, treatment outcome may be compromised.

Key Words: HIV/AIDS, Parasites, ART, Coinfection

LA PREVALENCE ET LA DISTRIBUTION DES INFECTIONS INTETINALES PARASITES CHEZ LES INDIVIDUS SEROPOSITIFS AU VIH SUR LA THERAPIE ANTIRETROVIRALE A VOM, ETAT DE PLATEAU AU NIGERIA

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RÉSUMÉ

Contexte : L'état immunologique d'un individu peut déterminer les résultats du traitement et leur capacité à lutter contre les infections opportunistes. Co - infection par d'autres parasites va confondre la situation ; cependant il n'y aucune information adéquate sur l'interaction entre VIH et les infections helminthiques. Nous voulions établir la relation de l'état immunologique et la prévalence des parasites intestinaux chez les patients au VIH/SIDA qui se sont inscrits pour la thérapieantirétrovirale au Centre de Sante de Chrétien de VOM.

Matériaux et Méthodes : Avec leur consentement, échantillons de selles de 205 sujets ont été recueillis et examinés parasitologiquement par des techniques de microscopie et de concentration directes. Leurs plus récent taux de CD4⁺ ont été obtenus au Centre. Les cultures caractéristiquesdémographiques des sujets étaientdéterminésà partir de leur réponses a un questionnaire.

Résultats : Sur les 205 sujets examinés, 61,9% d'entre eux avaient divers parasites avec les helminthes qui se produisent dans 51,9% des cas. Le groupes des 31 - 40 ans d'âge a été la plus infectée de manière significative ($P < 0,05$). Ankylostomes et *Schistosoma masonii*étaient les plus fréquents avec des taux de prévalence de 18,1% et 16,5% respectivement. La plus forte prévalence de parasites survenus chez des personnes au VIH/SIDA les cellules CD4⁺ entre 101 - 200 cellules / μ l et ceux avec les chiffres ci - dessous de 100 cellules. L'occupation a été fortement associée a des infections parasites ($P < 0,5$).

Conclusion : L'infection parasitaires est resté très répandue parmi les sujets examinés en dépit du traitement ART et dans le cas de l'infection intense chez les personnes immunodéprimées, le résultat du traitement peut être compromise.

Mots clés : VIH/SIDA, Parasites, ART, Co - infection.

BACKGROUND

Human immunodeficiency virus (HIV) causes progressive impairment of the body's cellular immune system leading to increased susceptibility to infections, tumors and fatal conditions of AIDS. HIV is an enveloped RNA virus, on infection the DNA the viral genome becomes integrated in the DNA of the infected cell ensuring permanent infection and replication of the virus. The virus becomes established with the cells bearing CD4 glycoprotein in their plasma membrane. The whole T cell population in the body begins to decline, leaving the patient open to opportunistic infection. A decrease in CD4+ T-lymphocyte counts is responsible for the profound immunodeficiencies that lead to various opportunistic infections in HIV infected patients. Since the beginning of the AIDS pandemic, opportunistic infections have been recognized as common complications of HIV infection. The spectrum of opportunistic infections in the HIV infected subjects varies from one region to another (1).

The aetiological spectrum of enteric pathogens causing diarrhoea includes bacteria, parasites, fungi and viruses². Gastrointestinal problems resulting from opportunistic parasitic infections in HIV and AIDS infected subjects often present as diarrhea and significant disease has been recorded in 50-96% of cases worldwide with 90% prevalence rate reported in Africa³. Either backed by HIV or independently, intestinal parasitic infections have continued to be major cause of morbidity and mortality in humans (4). Diarrhoea accounts for 50 million deaths worldwide and it ranks third among diseases responsible for human mortality globally (5). Intestinal parasitic infections are among the most common infections world-wide. It is estimated that some 3.5 billion people are affected, and 450 million are ill as a result of these infections (5). The rate of infection is remarkably high in Sub-Saharan Africa, where the majority of HIV and AIDS cases are concentrated (6). In developed countries diarrhea occurs in 30-60% of AIDS patients and 90% in the developing countries (7).

Diarrhea and weight loss are independent predictors of mortality (8). Acute and chronic diarrhea has been associated with different species of gastrointestinal parasites, which are responsible for considerable morbidity and mortality in HIV/AIDS patients (9). Many of the opportunistic infections that ultimately

plague such individuals involve infectious agents that are normally checked by the mucosal barriers which include *Cryptosporidium spp*, *Giardia lamblia*, *Entamoeba histolytica*, *Ascaris lumbricoides*, hookworm infection, *Schistosoma spp* and *Strongyloides stercoralis* are important cosmopolitan intestinal parasites that are common among children and immunocompromised individual (10).

Parasitic infections in HIV-infected patients are common in many regions and populations across Nigeria and represent a lasting public health challenge. There are a number of studies on parasites among HIV/AIDS patients in Nigeria with different prevalence rates. Due to the importance of intestinal parasites in HIV+/AIDS patients and because there are only few studies regarding the prevalence of intestinal parasites and their association with CD4+ cell counts in this population are available in Jos. This study was carried out to determine the prevalence and parasitic profile of intestinal infections in HIV/AIDS patients in relation to their immunologic status.

MATERIALS AND METHODS

Study design

This cross sectional survey involved interviewing of the HIV/AIDS patients using structured a questionnaire and also laboratory analysis of stool specimen for protozoa and helminth from the respondents. The study was carried out in Vom Christian Hospital, located in Jos- south of Plateau State Nigeria. The APIN laboratory was established in 2007 and it renders services to people from surrounding towns and villages like Turu, Vwang, Kuru, Farin lamba, Bukuru and other environs. Patients were enrolled from the months of March - April 2010.

Study Population

Stool samples were obtained from a total of 205 people who were confirmed to be HIV positive and were enrolled for antiretroviral therapy. Questionnaires were administered to them to obtain their demographic characteristics and gender status.

Ethical consideration

Ethical approval was obtained from the research ethics committee for the Vom Christian hospital. Written informed consent was obtained from all the study participants, and human experimentation guidelines of the hospital were followed.

Sample collection

A total of 205 stool specimens were collected in labeled, clean, leak-proof and wide mouth plastic containers from the patients enrolled for the study. The most recent CD4 T-cells counts of the participants were obtained from their ART follow-up record in the hospital.

Sample processing

Direct microscopy of smears was performed for the detection of ova, larvae, trophozoites as described by Cheesebrough (1999) and cysts of intestinal parasites and formol-ether concentration technique for helminthic ova and larva (12). A drop of stool concentrate was also stained by modified Ziehl-Neelsen staining technique for oocysts of *Isospora belli*, *Cryptosporidium* and *Cyclospora species* (13).

RESULT

The prevalence of intestinal parasites among HIV/AIDS infected people in Jos was 61.9% with 3.1% having multiple parasites infection. More of the people who enrolled for the survey were women and they also had the highest prevalence of 40% intestinal

parasites while men recorded a prevalence rate of 22% infection. Both male and female HIV/AIDS patients within the age range 30-39 had the highest prevalence rates of intestinal infection.

During this survey eight different species of intestinal parasites were identified from the population studied. Majority of the intestinal parasites were geohelminths which recorded a prevalence of 59.1%. Hookworm recorded the highest prevalence rate of 18.1% followed by *Schistosoma mansoni* with a prevalence of 16.5% while the lowest parasite reported was *Trichuris trichiura* with a prevalence rate of 6.3%. HIV/AIDS patients who said their occupation was farming and house wives had the highest rates of intestinal parasites.

The minimum CD4+ cell count was 13cells/ μ l and the maximum count was 711cells/ μ l. the highest prevalence of parasites occurred in HIV/AIDS people with CD4+ cells between 101-200 cells/ μ l and those with counts below 100cells/ μ l.

TABLE 1: AGE AND SEX DISTRIBUTION OF HIV/AIDS SUBJECTS WITH INTESTINAL PARASITES IN VOM

Age Range	Males		Females		Total	
	Examined	Positive (%)	Examined	Positive (%)	Examined	Positive (%)
≤ 19	6	4 (1.95)	17	11 (5.37)	23	15 (7.32)
20-29	23	13 (6.34)	39	24 (11.7)	62	37 (18.1)
30-39	25	17 (8.29)	32	21 (10.2)	57	38 (18.5)
40-49	18	8 (3.90)	27	17 (8.29)	45	25 (12.2)
≥ 50	5	3 (1.46)	13	9 (4.39)	18	12 (5.85)
Total	77	45 (21.9)	128	82 (40.0)	205	127 (61.9)

p-value = 0.696 (sex); p-value = 0.066 (age group)

TABLE 2: SINGLE AND MULTIPLE HELMINTH/PROTOZOA INFECTIONS IN HIV/AIDS INFECTED SUBJECTS IN VOM

TYPE OF PARASITE INFECTION	NUMBER POSITIVE (%)
Protozoa	48(37.8%)
Helminth	75(59.1%)
Multiple infections	4(3.1%)
TOTAL	127(61.9%)

TABLE 3: PREVALENCE AND DISTRIBUTION OF HELMINTH/PROTOZOA OVA IN HIV/AIDS INFECTED PATIENTS ON ART IN VOM

Parasites (Ova/ Cyst)	Prevalence Rate (%)
<i>Entamoeba histolytica</i>	18 (8.78)
<i>Cryptosporidium parvum</i>	17 (5.37)
<i>Entamoeba coli</i>	15 (7.32)
<i>Trichuris trichiura</i>	8 (3.90)
Hookworm	23 (11.2)
<i>Ascaris lumbricoides</i>	16 (7.80)
<i>Schistosoma mansoni</i>	21 (10.2)
<i>Hymenolepis nana</i>	9 (4.39)

TABLE 4: DISTRIBUTION OF INTESTINAL PARASITES AND CD4⁺ CELL COUNTS IN HIV/AIDS INFECTED PATIENTS IN VOM

CD4 ⁺ cell counts (cells/μl)	E	A	C	S	En	T	H	Hy	Total (%)
≤ 100	5	3	3	6	4	0	3	0	24(11.7)
101-200	4	5	4	3	5	3	6	3	33(16.1)
201-300	0	0	0	0	0	0	0	0	0 (0.00)
301-400	3	3	1	5	1	2	2	3	20(9.75)
401-500	2	2	5	3	2	1	5	2	22(10.7)
501-600	3	1	2	3	2	2	4	0	17(8.29)
≥ 601	1	2	2	1	1	0	3	1	11(5.37)
Total	18	16	17	21	15	8	23	9	127(61.9)

KEY: E- *Entamoeba histolytica*; A- *Ascaris lumbricoides*; C- *Cryptosporidium parvum*; S- *Schistosoma mansoni*; En- *Entamoeba coli* T- *Trichuris trichiura*; H- Hookworm; Hy- *Hymenolepis nana*

TABLE 5: PREVALENCE OF INTESTINAL PARASITE INFECTION IN HIV/AIDS PATIENTS IN VOM WITH RESPECT TO OCCUPATION

Occupation	Number of Respondents	Number Positive (%)
Civil servants	32	23 (11.2)
Farmers	47	28 (13.7)
House wives	72	33 (16.1)
Artisan and Students	17	16 (7.80)
Unemployed	30	24 (11.7)
Medical workers	04	02 (0.98)

Long distance driver	03	01 (0.49)
Total	205	127 (61.9)

P value=0.001

DISCUSSION

HIV infection is believed to be a significant risk factor for acquiring intestinal parasitic infection (14). Our study was carried out in Vom where most of the participants are rural dwellers. The prevalence of intestinal parasitic infection among HIV/AIDS infected persons was 61.9% in this study which confirms several similar reports in Nigeria. Inabo *et al.*, (15) had reported prevalence rates between 60-70% in HIV/AIDS infected persons in

Zaria Nigeria, 69.2% in Ethiopia¹⁶, 63.9% in Rio de Janeiro (17). Lower rates were however reported in Benin (14), Nassarawa Toto (18), Apulia, Italy (19), in East Delhi (20), in Abuja and Abeokuta, respectively (261, 22, 23). However higher prevalence rates of 89.5% has been reported in Lagos²⁴ among HIV infected subjects. The varying prevalence rates may be due to geographical variation of the study locations and is likely to depend upon the endemicity of that particular parasite in the community (25).

In this study 3.1% of the HIV infected people had multiple intestinal parasitic infections lower than it was reported by Inabo *et al* (15) in Zaria. Female HIV patients had a higher prevalence rate of intestinal parasitic infection (40%) than the HIV infected men (21.9%). Gender was not significantly associated with the rate of parasitic infection in this study population ($p=0.696$). Akinbo *et al* (14) had reported that gender was significantly associated with the prevalence of intestinal parasitic infections among HIV-infected patients although that study found more HIV intestinal parasitic infection in men while Kipyegen *et al* (26) reported no significant association between intestinal parasitic infection and gender. Age was not a significant factor associated with parasitic infection in this study ($p=0.066$) even though in both male and female HIV infected patients, those within the age range 30-39 had the highest rate of intestinal parasites. Kipyegen *et al* (26) reported no significant association between age and parasitic infection.

The HIV/AIDS patients in this population had a higher prevalence of helminthes infections (59.1%) than protozoan infections (37.8%). This is not in consistent with most findings; Kipyegen *et al* (26) reported a higher prevalence of protozoan infections among HIV patients in Baringo, Kenya. Inabo *et al* (1) also reported higher rate of coccidian parasites than helminthes. Among the helminthes, hookworms were more prevalent (18.1%) followed by *Schistosoma mansonii* (16.5%). Kipyegen *et al* (26) reported hookworms as the least prevalent parasite in HIV infected subjects in in Kenya ((1.3%), Abaver *et al* (18) also reported Hookworms (8.5%) and *S. mansonii* (5.7%) as the most prevalent intestinal helminth in HIV infected patients in Toto, Nigeria. Akinbo *et al* (14) reported *Ascaris lumbricoides* (33.1%) to be the most prevalent intestinal parasite in HIV infected subjects in Benin followed by hookworm (20.6%). The prevalence of hookworm in this study population is lower than that reported in Benin. In Ilorin Nigeria *S. stercoraris* was the most prevalent helminth in HIV infected persons (27).

Entamoeba histolytica/dispar was the only pathogenic parasite found in this study (8.78%). Studies indicate increased risk for invasive amoebiasis among HIV infected persons (28).

In this study with HIV subjects in Vom, *Cryptosporidium parvum* was the only opportunistic emerging parasite observed. Amatya *et al*²⁹ also found a higher prevalence of coccidian parasite amongst HIV infected persons in Nepal with Cryptosporidia as the most frequent coccidian parasite. Even though studies have highlighted *Cryptosporidium* species as the predominant pathogen with significant association to diarrheal cases (30) and occurrence of Cryptosporidium in both symptomatic and asymptomatic cases indicates high risk of infection in this parasite. The parasitic infections detected in this study have been reported in Nigeria and other African countries among HIV/AIDS infected subjects. The low prevalence of pathogenic protozoa and opportunistic emerging parasites (coccidian) may be due to the time this study was carried out as the organisms have been reported to be prevalent in humid temperatures.

On the socioeconomic factors, occupation of the subjects was found to be a significant factor associated with the prevalence of HIV/AIDS co-infection among the respondents in Vom ($p=0.001$). House wives, farmers and Civil servants had 16.1%, 13.7% and 11.2% prevalence respectively. Akinbo *et al* (14) had also reported a significant association between parasitic infection and occupation among HIV patients in Benin Nigeria with artisans, farmers and security guards having high prevalent rates.

Out of the 127 subjects with HIV/AIDS and intestinal parasite co-infections, 22.1% had CD₄⁺ T cell count ≥ 501 cells/ μ l, 33.1% had CD₄⁺ T cell count between 200-500 cells/ μ l and 44.9% had CD₄⁺ T cells ≤ 200 cells/ μ l. studies have reported that most infections with opportunistic parasites and pathogenic parasites were associated with CD₄⁺ cells below 200 cells/ μ l. Even though most of the parasites isolated were in the group of patients who had CD₄⁺ T cell counts below 200 cells/ μ l. This study shows that, parasite infection was not directly associated with CD4 T-cell counts, as parasite infection was observed in patients across all the ranges of CD4 cell counts however, the intensity of the infection may influence treatment outcome in patients who are immunocompromised.

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